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PHYSICAL SCIENCES

VISTAS

PERSPECTIVES ON EXCELLENCE IN COMMUNITY RELATIONS | ISSUE 1 2021

INSIDE

Los Alamos NATIONAL LABORATORY

CONTENTS

On the cover: Following safety protocols, Helen Milenski uses a handheld contamination monitor to scan her extremities prior to leaving a glovebox area.

LEARN MORE ABOUT PHYSICAL SCIENCES AT LOS ALAMOS NATIONAL LABORATORY
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In preparation for a high-hazard, no-second-chances experiment, Etienne Vermeulen practices the procedure for moving a radioactive sample, strontium-82, from a lead container (green cylinder) to the ALSOLENZ vacuum chamber in the Weapons Neutron Research Facility's flight path 15R at the Los Alamos Neutron Science Center. Here, Vermeulen recreates the process using a dummy sample, shown in the orange circle foil mounted in the vacuum flange he holds.

The experiment—by Principal Investigator Hye Young Lee (Nuclear and Particle Physics and Applications, P-3), Co-Principal Investigator Vermeulen (Inorganic, Isotope, and Actinide Chemistry, C-IIAC), and collaborators—is part of a Laboratory-Directed Research and Development project aimed at uncovering the origins of heavy element production in astrophysical environments. The experimental technique developed for the project could also be a boon for weapons science by enabling the generation of essential weapons data—in particular, extremely difficult to measure nuclear cross sections.

FROM TONI'S DESK

Toni Taylor, Associate Laboratory Director for Physical Sciences

Welcome to 2021 and the year's first issue of *Physical Sciences Vistas*, which highlights the directorate's community relations endeavors. Community relations is one strategic area in which the Lab strives for excellence.

I am immensely proud of our staff members' engagement in our Northern New Mexico community, especially in the time of COVID. Their generosity and accomplishments are featured in stories that describe:

- How the Los Alamos Employees' Scholarship Fund helped Helen Milenski jumpstart her technical career at the Lab—and how today she is returning the favor by serving on its advisory committee, enabling others to have similar opportunities.
- What it has been like to volunteer during this challenging past year, in the words of our staff. The reason why they give of their time—taking in stride changes due to pandemic precautions—is the rewarding experience that comes with volunteering.
- Why, according to Astrid Morreale, scientists are in an advantageous position to strengthen the presence of science in our communities. Morreale is the recently elected vice chair of the American Physical Society's Four Corners Section.
- How our staff have come together to ensure Laboratory resources and our environment are stewarded with care, creativity, dedication, and forethought.

The issue also highlights a sure demonstration of excellence in mission operations. The Sigma Strive for Excellence Team comprises staff from across the Laboratory who have voluntarily come together to improve safety, quality, and productivity in the mission-critical Sigma Complex.

In an example of excellence in mission-focused science, technology, and engineering, a highlight describes the development of a novel adaptive machine-learning method for reconstructing three-dimensional crystals. The proof-of-concept work, by Alex Scheinker and Reeju Pokharel, supports efforts to develop microstructure-aware physics-based models and to design advanced materials with tailored properties.

Our next issue of *Vistas* will focus on more examples of excellence in mission-focused science, technology, and engineering. It will also highlight how we are piloting an asset management program for programmatic equipment. This strategic approach to ensuring the availability of critical equipment will help us achieve our national security mission.

Toni

Helen Milenski is a glovebox certified worker and a fissile material handler. Here, in a glovebox used for training purposes, she demonstrates the proper procedure for inspecting tools prior to use in material corrosion studies.

Helen Milenski: Finding and aiding success through the Lab's employee scholarship fund

When Helen Milenski dons her personal protection equipment in preparation for working in the Lab's Plutonium Facility, she said she sometimes thinks back to 2014, when she decided to go back to school.

To land the job that would fulfill her life's desires and provide her with the financial stability she needed, Milenski recognized she needed a degree to complement her project administration experience gained from working with the State of New Mexico and with a Lab contractor.

Recently remarried to a "wonderful and supportive" husband, Milenski, therefore, was contemplating a career change, she said, because she felt a lot of responsibility for raising her two daughters. "I felt I needed to contribute financially to their well being."

With the family budget tight, she applied to the Los Alamos Employees' Scholarship Fund (LAESF) for assistance. To her surprise, she said, she received what is now known as a Career Pathways Scholarship, which helps students pursue a two-year degree or trade certification. (Please see "Helping area students pay for college" for more details.)

"Receiving that scholarship—it meant everything to me," she said. "Without that LAESF scholarship I would not be where I am today."

Getting a head start

Today, Milenski is a research technician on the Nuclear Materials Science's (MST-16) Corrosion Team, contributing to understanding the phenomenon's effects on a variety of materials in a variety of environments. She is also a volunteer member of the LAESF Advisory Committee, helping others benefit as she did.

"The LAESF scholarship I received enabled me to kick-start an amazing career," said Milenski, who through a subsequent Bronze Scholarship, began initial studies in mechanical engineering.

"The scholarship is more than just funding," she said. "When you are awarded a LAESF scholarship, you become a LANL Scholar and have more opportunities to network with scientists and engineers interested in providing students with internships."

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Helen Milenski continued ...

For Milenski, this included completing her associate of science degree in pre-engineering, interning at the Laboratory, and gaining experience in glovebox use, which she said, allowed her to "hit the ground running," in her LANL staff position. Recently accepted into the Nuclear Enterprise Science and Technology Certificate Program at the University of New Mexico-Los Alamos, Milenski said she is excited to begin furthering her knowledge of nuclear facility work and actinide sciences.

Returning the favor

As a member of the LAESF Advisory Committee, Milenski evaluates applications and makes recommendations for awards from the hundreds of requests received from students throughout Northern New Mexico.

According to Milenski, the need to help nontraditional students is more pronounced today than just four years ago, when she completed her degree. "Nontraditional does not apply only to older students," she said. "There are many young people who have taken a year or so off to work or explore other things in life and are now ready to restart their education."

"In reviewing the scholarship applications today, I am often reminded of where I was just a handful of years ago," she said. "I know now what's possible because of these scholarships and I am happy to be in a position to play a small part in making opportunities for people who find themselves, like me a few years ago, having to start over." ■

Helping area students pay for college

In 1998, Los Alamos National Laboratory and its employees, retirees, and contractors partnered with the Los Alamos National Laboratory Foundation to create the Los Alamos Employees' Scholarship Fund. The fund's goal is to provide scholarships that support the students of Northern New Mexico who are pursuing degrees in fields that will serve the region.

Awards are based on academic performance, leadership potential, critical thinking skills, and career goals. Financial need, diversity, and regional representation are integral components of the selections process.

Scholarships support Northern New Mexico students in all fields of study—not just science, technology, engineering and math—to attend local and out-of-state colleges and universities. Awards are offered in two categories: Career Pathways and Four-year Undergraduate scholarships.

In 2020, according to the LANL Foundation, 110 Northern New Mexico students pursuing bachelor's degrees received 115 scholarships worth $743,000.

MEET ASTRID MORREALE

R&D Scientist, Nuclear and Particle Physics and Applications (P-3)

Astrid Morreale is the recently elected vice chair of the American Physical Society's Four Corners Section (APS4CS). As a member of its executive committee she helps advance the section's mission to provide opportunities supporting the professional development of scientists and students in the Four Corners region of New Mexico, Arizona, Colorado, and Utah.

"As physicists we have an advantageous position to be able to reach out to both the general and specialized public thanks to the multidisciplinary predisposition of our field," Morreale said. "It is of crucial importance, especially now, that we invest within our communities to ensure that science in general has a strong presence in every household."

Morreale is a member of the High Energy Nuclear Physics Team in Nuclear and Particle Physics and Applications (P-3). Her research expertise encompasses hadronic/nuclear structure in a variety of collision systems and center of mass energies.

Morreale has been involved in the Lab's American Indian Employee Resource Group and said she plans to use her APS4CS term to advocate for underrepresented minorities in the section, especially scientists in the Native American community. Her four-year term—as vice chair, chair-elect, chair, and past chair—began this fall.

After earning her PhD in 2009 in nuclear and particle physics from the University of California, Riverside, Morreale accepted a private investigator grant from the National Science Foundation to work at the Atomic Energy Commission in France. She remained in Europe for the next 10 years and received her "Habilitation thesis in physics," the highest title that can be conferred upon a scholar in France. Prior to joining the Lab in 2019, she was an associate professor at the Engineering School IMT of Nantes (France) and performed her research at the Large Hadron Collider. She is a peer reviewer for several national and international journals and a fellowship evaluator for the European Research Council, Horizon H2020 initiative. Morreale is a United States Marine Corps veteran. ■

Offering perspective on **helping others** throughout Northern New Mexico

Every year members of the Physical Sciences Directorate volunteer their time and talent to help provide resources and assistance throughout Northern New Mexico and beyond. These efforts range from community service projects to science, technology, engineering, and math (STEM) education or learning activities. Here, in their own words, directorate staff describe some of their experiences, why they volunteer, and how recent activities have differed from those in years past, including offering some distinct opportunities.

Priscila Rosa, MPA-Quantum (MPA-Q)
—Summer Physics Camp for Young Women instructor

"I believe a diverse workforce is key for us to thrive not only as a Laboratory but also more broadly as a scientific community," said Priscila Rosa, who has volunteered at the summer camp every year since its inception, and every time is "thrilled by the potential, the curiosity, and the creativity of the students." For the materials science session this past year, Rosa prepared more than two dozen kits for the students to make sugar crystal/rock candy at home. In "a silver lining" due to the event's virtual format, the session included a pre-taped tour of a LANL crystal growth lab.

"I took away from this experience that we can make a difference in the future of students, in particular underrepresented minorities, by providing a role model and encouraging them to find and pursue their passion in science. I would encourage others to consider volunteering as we need more volunteers to make a long-lasting change."

Having the support of the Laboratory, through its paid volunteer time, "is really empowering … Service time provides recognition to volunteers and shows that the Lab is actively supporting sustainable efforts to improve diversity, equity, and inclusion."

Alice I. Smith, Nuclear Materials Science (MST-16)
—Summer Physics Camp for Young Women instructor

This past year, Alice Smith said, with travel out of the question, as well as "in-person gatherings, classes, experiments, and tours of the Laboratory and facilities such as the Los Alamos Neutron Science Center, the Center for Integrated Nanotechnologies, and the National High Magnetic Field Laboratory … what started as a difficult mission turned out to be a great success." The virtual camp brought 90 Lab staff members and external speakers from around the world to more than 20 campers through live video lectures and demonstrations, virtual tours, online breaks, "and even an ice cream social—all opportunities for students to interact with the organizers, presenters, and volunteers." There "were plenty of opportunities for interactions, exchange of information, and answering a variety of questions … I was extremely impressed by the drive and passion for science exhibited by the students, by their enthusiasm, curiosity, and quest for answers."

Tiffany Desjardins, Applied and Fundamental Physics (P-2)
—Summer Physics Camp for Young Women instructor

This past year's summer camp "was particularly special for the volunteer experience," said Tiffany Desjardins. She and her colleagues Elizabeth Merritt, Rachel Glade, and Dennis Aslangil, "worked through e-mail and WebEx" to put together a presentation on fluids, instabilities, and turbulence. Using water and a glass canning jar with a metal mesh lid, Desjardins recorded a hands-on demonstration with a webcam set up in her living room. "The young women … were really engaged in the process, even though it was all digital," she said. "It was great to know they connected and were excited." Although the appreciation she has received from students means a great deal, this past year, "the parent comments really hit home for me," she said. "They made it clear how much their child hadn't thought they could do science or programming but had found a passion in it because of the summer camp. All it took was some time from some people to show them what was out there and possible. It's hard, but get out of your comfort box and share your passion. It really can make a difference in somebody's life."

Loren I Espada Castillo, Engineered Materials (MST-7)
—Summer Physics Camp for Young Women instructor; Bradbury Museum Scientists Ambassador Academy trainee

"I have made it my mission to share my passion for physics and materials science with people of all ages," said Loren Espada Castillo. "There is no greater feeling of accomplishment than to inspire others, especially young girls, to pursue a career in science and engineering."

For her electromagnetism session at the camp, Espada and her colleagues Vivien Zapf, Priscila Rosa, and Hubert van Hecke led participants in building a magnetic train, which was a big hit. "They just show us that we just need to put the information in front of them for them to run with it … I was impressed by these young ladies' enthusiasm, dedication, and interests in what we have to share with them."

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Offering perspective continued ...

"At a personal level, (this past year's camp) did leave a lasting impression since this was done under very special circumstances. It comes to show that when we believe in something and we come together, our strength to make things happen is even greater and stronger."

Bade Sayki, Dynamic Imaging and Radiography (P-1)
—Barranca Elementary Science Fair judge

Bade Sayki sought out this science fair in particular, she said, as it offered the opportunity to reach students at an age when enthusiasm for science can begin to wane. "I wanted to volunteer for this particular event because it is within that sensitive time period and I think it is a good opportunity to humanize the image of who a scientist is for these young curious minds, so that science as a career seems more realistic … (STEM volunteering) is a great opportunity for the scientists at LANL, where we can give back to our community in a very personal way, making an impact at raising the future generations of scientists."

Tyagi Ramakrishnan, Instrumentation and Controls (AOT-IC)
—LANSCE tour escort

Newly hired staff member Tyagi Ramakrishnan had his first LANL volunteer experience just before COVID guidelines were enacted. His service as an escort during a Los Alamos Neutron Science Center tour enabled a group of high school students to see first-hand the accelerator and talk with scientists who use it for groundbreaking science. It also had an unexpected side benefit for him, allowing him to deepen his understanding of the facility at which he works. "Volunteering as a field trip escort is great to gain more insight into a certain process or facility you are working on," he said. "I would encourage all new employees to participate to get experience and the knowledge that comes with it."

Astrid Morreale, Nuclear and Particle Physics and Applications (P-3)
—River/STEM festival presenter

As a scientist and former United States Marine, Astrid Morreale has performed outreach activities in every laboratory and country in which she has been stationed. At Los Alamos she recently delivered a virtual presentation on fundamental physics research "to a heavily underrepresented group in the scientific field," she said. "Fundamental science in our region can only benefit in the long term from a more balanced participation from folks in all corners. This naturally includes the future scientists from our neighboring pueblos." For Morreale, virtual outreach activities offer "new, unexpected potential … In particular the media possibilities—the chat interactions that allow a participant to jump in whenever—are something with a large potential to exploit." To learn more about Morreale, please see "Meet Astrid Morreale" on page 3.

Jennie Schei Disterhaupt, Dynamic Imaging and Radiography (P-1)
—Hour of Code instructor

During her Hour of Code with a kindergarten class, Jennie Schei Disterhaupt said she met with both the youngsters and their "sixth-grade buddies." Despite their knowledge differences, the students' "engagement was the same … It was really rewarding to watch the kids figure out how coding can make the program do something that they chose. They would light up when they saw something work in the way that they anticipated. I would encourage anyone with an inkling to volunteer to go for it. It has always been a rewarding experience to share my knowledge and experience with others, especially the next generation."

Don Brown, Materials Science in Radiation and Dynamics Extremes (MST-8)
—Food distribution volunteer

Faced with not being able to donate blood—as is his long-time volunteer practice, Don Brown turned to another potentially lifesaving volunteer endeavor: helping families in Northern New Mexico put food on the table.

Brown said he was "shocked by the scale of food need in New Mexico" he witnessed. During an event in Los Alamos, "it was pretty humbling to see the line of cars snaking out of the United Methodist parking lot and all the way around the high school lot well before the distribution began and continuing for over an hour." In return, his time spent redistributing large quantities of food into single family portions—while listening to a playlist of 80s heavy metal and hair bands—has given him, he said, "a legitimate reason to get out of my house, off the hill, and interact (even if minimally) with other volunteers. This has been part of my coping mechanism with COVID restrictions."

He is now joined by his daughters (shown with one of them in the photo) at The Food Depot in Santa Fe and "they have each, on occasion, taken friends to volunteer and those friends' parents have thanked me for getting their children involved. This was much appreciated."

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X-ray tomography instrument reimagined for use at Oregon State University

After a distinguished career in support of the Laboratory's weapons and fundamental science missions, an x-ray micro-computed tomography instrument is getting a new image and a new home at Oregon State University (OSU).

The Xradia machine was originally purchased in 2006 by Engineered Materials (MST-7) to characterize target materials in support of fusion and high-energy-density physics research for the Lab's Science Campaigns.

The Xradia machine was recently refurbished and put to work by Haori Yang in the OSU College of Engineering, Department of Nuclear Science and Engineering. There it is being used to enhance his program's work in muon tomographic sensor development.

This donation recycled many valuable components and delayed their eventual placement in a landfill. The successful donation was an 18-month process that required the expertise of staff from across the Laboratory, including in the Chief Information Office, and Property Management, Radiation Protection, and Shipping organizations, as well as approval from the General Services Administration.

At LANL, the device went on to support a variety of additional programs, including the Engineering Campaigns, Directed Stockpile Work, Laboratory Directed Research and Development, and the Joint Munitions Program. Sample types imaged by the instrument ranged from polymers and metals to explosives and coated materials. These materials were made with traditional and advanced manufacturing methods, including numerous additive manufacturing techniques. The resulting three-dimensional images helped to answer material morphology questions related to dimensional quality, to understand materials for aging and manufacturing studies, and to characterize damaged materials. During collaborative research involving staff from across LANL, the NNSA Complex, and a variety of universities, the instrument collected tens of terabytes of three-dimensional imaging data. The instrument was replaced with a much more capable Carl Zeiss X-ray Microscopy Inc., Versa 520 x-ray micro-computed tomography instrument.

Technical contact: Brian M. Patterson ■

Far left: The old x-ray micro-computed tomography instrument being preparing for shipping. Left: Brian Patterson (seated) and Hans Hermann with the new Xradia Versa 520 x-ray micro-computed tomography instrument. This device is capable of nondestructively imaging samples as large as a softball (96.5-mm diameter) with ~20-micrometer resolution, down to samples as small as a pinhead (1-mm diameter) with ~0.6-micrometer resolution. Additional capabilities include an integrated tension and compression load cell (with a maximum 500-N force) capable of temperature control ranging from -20°C to +160°C for integrated three-dimensional imaging with interrupted in situ experiments. Also, the instrument is capable of dual energy imaging, phase contrast imaging, and diffraction contrast imaging (DCT). With this DCT modality, mapping the grain structure of metals (currently limited to cubic and hexagonal structures) in materials with grains larger than ~40 micrometers is possible.

Offering perspective continued ...

Michael Middlemas,
Nuclear Materials Science (MST-16)
—Food distribution volunteer

In the past when Michael Middlemas volunteered with The Food Depot in Santa Fe, the organization "would serve a few hundred people," he said. "When I was helping them in March, they were serving 3,000." Soon after the Lab moved to full telework in the spring, he used the schedule flexibility to volunteer with Kitchen Angels, a nonprofit preparing and delivering 190 meals a day to housebound people in need. "It was inspiring to work with the long-term volunteers who have made helping others a big part of their lives. With all the social distancing, it was a great opportunity to be around other people while not feeling bad about gathering."

After returning to work, Middlemas said he had to quit volunteering at Kitchen Angels. "They needed volunteers that could maintain strict social distancing since the people they serve are very high risk. It was a great experience and I would like to seek out other volunteer opportunities in the future … I think it is great that LANL has encouraged employees to get out into the community and volunteer. With so many parts of life feeling out of control, it's nice to be able to do something you know makes an immediate difference in someone's life. ■

Potentially activated metal recycle project **triples its goal**

— *Team recognized with pollution prevention award*

For its formidable effort in seeing more than 1.5 million pounds of potentially activated metal removed from the Los Alamos Neutron Science Center (LANSCE) mesa, the Site Cleanup Program Metals Team won a gold Patricia E. Gallagher Environmental Award.

The project, "Potentially activated metal recycle," was nominated by LANSCE Facility Operations Director Gary Hagermann, who said the site cleanup program team worked in snow, rain, and sun to exceed its goal.

The dedicated team focused on a backlog of metal, with the goal of 500,000 pounds. However, with attention to detail and hard work, they exceeded that goal—releasing and recycling 1.5 million pounds of metal. This LANL record equates to more than 240 pieces of metal and over 35 truckloads.

The team included staff from Facilities and Operations; Environment, Safety, Health, Quality, Safeguards, and Security; and Physical Sciences directorates. The gold award is otherwise known as a Pollution Prevention award, which is a special recognition category of the Patricia E. Gallagher Environmental Awards.

For years, metal shielding, equipment, and magnets had been stored across the LANSCE mesa. This metal was from near the beam line and was considered potentially activated (radiological). Until several years ago, there was no proven technical method to release this metal. The options were to let it decay in a radiological control area, which took more than 20 years, or treat it as low level waste. The waste options are costly and a burden to programs without a funding source.

The former Metals Working Group worked with subject matter experts to develop a technical baseline document for the metal's release. With the process, 95% of the metal can be released for recycling. This detailed process has several steps performed by a dedicated team.

The end result is metal is recycled instead of sitting around for years or is handled as waste. This is a great success for the Lab as it reduces environmental risk and cleans up outdoor spaces. ■

Working in conditions that ranged from hot and sunny to cold and snowy, the team recycled 1.5 million pounds of metal, a Laboratory record.

Three items released for recycling weighed almost 25 tons or 50,000 pounds. They were part of equipment that was part of the accelerator, but not directly in the beam line, at LANSCE. This load was considered oversized and required the trucking company to have a Department of Transportation oversize load permit.

GET THE DETAILS

Participants: Team members include Kevin Andrews, Mike Duran, John Eddleman, Esteban Garcia, Sean Hollander, Hargis James, Richie Mondragon, Courtney Perkins, Andrea Pistone, Kiko Rael, Laurel Sharisky, Joseph Shepherd, and Jeff Whicker. **Funding:** The Site Cleanup Program oversees this work with funding from NA-532 Office of Nuclear Material Integration. Work is executed in collaboration with Accelerator Operations and Technology (AOT), Deployed ESH-LANSCE Facility Operations (DESH-LFO), Environmental Compliance Programs (EPC-CP), LANSCE Facility Operations (LANSCE-FO), and Logistics (LOG).

Adaptive 3D machine-learning method for 3D coherent diffraction imaging

In proof-of-concept work featured on the cover of the *Journal of Applied Physics*, Alex Scheinker (RF Engineering, AOT-RFE) and Reeju Pokharel (Materials Science in Radiation and Dynamics Extremes, MST-8) demonstrated a novel adaptive machine-learning approach for reconstructing three-dimensional (3D) crystals from coherent diffraction imaging (CDI).

In situ characterization of detailed 3D views of materials' defects and interfaces and their evolution at the mesoscale are required to develop microstructure-aware physics-based models and to design advanced materials with tailored properties.

CDI is a nondestructive x-ray imaging technique used in a wide range of scientific studies, including interrogation of crystal properties. However, CDI records only the intensity of the complex diffraction pattern originating from the illuminated sample volume, in which all phase information is lost.

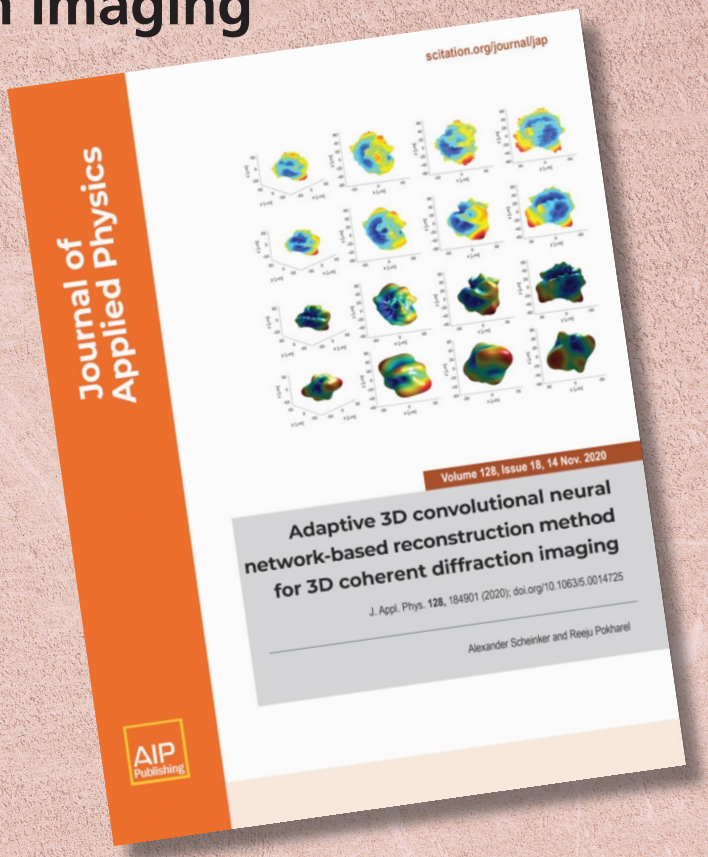
"Our technique aims to improve on the often lengthy and computationally expensive existing iterative numerical phase retrieval methods and to make them more robust to noise in the detected diffraction patterns," Scheinker said.

The challenges of iterative phase retrieval make it a good candidate for machine learning, offering the potential to speed reconstruction by providing an initial parameter estimate, which is then fine-tuned by traditional methods to achieve accurate results.

Scheinker and Pokharel used 3D convolutional neural networks (CNN)—powerful tools that can learn relationships between parameters in complex systems—together with an ensemble of model-independent adaptive feedback agents to reconstruct 3D volumes based only on CDI measurements.

Benefits of their approach include an end product that is an analytic representation of the reconstructed object density—rather than just an image or 3D density volume. Future work will study the acceleration and improvement in this approach's performance by using a 3D CNN to directly generate the entire 3D volume density, which will then be used as the starting point for their adaptive methods.

The NNSA has an enduring need for a deeper understanding of dynamic material behavior at the mesoscale. Free electron lasers can provide short bright coherent flashes of hard x-rays for CDI imaging to address this need. Existing CDI methods



The cover illustration shows the results of using the 3D CNN output as the initial guess for the 3D electron density of a ~50 μm³ sample based only on diffraction intensity measurements.

are not fast enough to produce reconstructions in real time that can provide feedback to experimenters. The CDI reconstruction method that Scheinker and Pokharel are developing has the potential to provide real-time CDI reconstructions that enable real-time feedback for adaptive CDI experiments at current and future free electron laser facilities. ■

GET THE DETAILS

Mission connection: The work supports Los Alamos's Stockpile Stewardship mission area and its Materials for the Future and Information Science and Technology science pillars. It leveraged the Lab's modeling and simulation capabilities and benefited from sample prep using high-energy x-ray diffraction microscopy performed at the Advanced Photon Source. **Funding:** The Lab's Institute of Materials Science funded the work. **Reference:** "Adaptive 3D convolutional neural network-based reconstruction method for 3D coherent diffraction imaging," *Journal of Applied Physics* 128 (2020). **Technical contacts:** Alex Scheinker, Reeju Pokharel

Sigma team aims for excellence in safety, quality, productivity

To meet the demands inherent in mission-critical deliverables, Sigma Complex activities must operate like a well-oiled machine. Sigma drives several of the Lab's national security projects, including housing graphite mold production for the Lab's 30 pits per year commitment, a Hydro Dynamic Test Program Level-2 Milestone, and an Alt 940 Level-2 Milestone. It's also a more than 60-year-old facility undergoing a major retooling designed to ensure its continued success in supporting the Lab's mission. This means that on any given day, the over 200,000-square-foot complex is a mix of R&D experimentalists and technicians, facility and operations professionals, and construction craft and supervisors.

To help with keeping this engine humming, a group of dedicated individuals have assembled as the "Sigma Strive for Excellence Team." The innovation of 17 voluntary members from Construction Management (PIO-CM), Science and Technology Operations (STO-FOD), Sigma programs, Sigma industrial safety and hygiene, and PIO-CM radiation control and safety, the team "aims to be a means for Sigma employees to participate in the pursuit of improved safety and security performance and quality assurance," said Greg Barna (Infrastructure and Small Projects, I-SP).

Operating with the expectation that "safety equals quality equals production," Barna said the team focuses on "identifying and solving issues that impede safety, quality, and productivity."

Construction maintenance staff serve as the primary source for integrating between facility operations staff, program management, and industrial hygiene and radiation protection professionals.

The Strive for Excellence Team was created after two injuries occurred and craft and superintendents delivered feedback that change was required. "We have good people throughout Sigma that want to be high performers," Barna said. "We have a Construction Management Group of craft and management that wants to continuously improve and takes pride in all phases of construction. As management, we just need to give them the tools." The team takes a collaborative approach, as it is a complement to existing site programs. "We want to drive—and be an advocate for—a strong safety culture," Barna said.

From left: Michelle Lucero (sheet metal foreman), Ron Serros (superintendent), and Ramon Maestas (iron worker foreman) from the Sigma Construction Maintenance Group review design drawings prior to initiating rigging and lifting activities. These individuals are practicing task preview and STAR error prevention techniques prior to performing critical activities.

For example, taking a cue from human performance improvement initiatives in the nuclear power industry, the team is creating a "10 pillars of error prevention" plan to ensure success in Sigma's construction management projects. The plan relies on the Safe Conduct of Research Principles and "10 pillars of excellence" that include actions such as self-checking; teamwork; communications, task preview, procedure adherence, and configuration control; and housekeeping, turnover and command and control, and oversight.

The team has already drafted a charter by which to operate, defined aggressive goals for the coming year, outlined roles—including voting rights—and responsibilities, and developed a list of issues and corrective actions. The team meets monthly where an action plan for finalizing the Sigma Strive for Excellence Plan is being tracked to completion. Issues are obtained from the team members and actions created to track these issues to closure.

Aligned with improving safety, quality, and production, draft goals include no lost work day cases or medical treatments and targets for integrated work documents, design compliance, and schedule compliance.

"The Sigma Strive for Excellence Team is a model example of 'how we are doing things is just as important as what we are doing,' " said Sigma Division Leader David Pugmire. ■

From left: Sean Raybon (iron worker), Ramon Maestas, and Matt Lucero (operator) perform the lifting and rigging activity as planned and keep a careful eye on the positioning of a ventilation duct.

A new x-ray detector technology developed by Wanyi Nie and her Los Alamos and Argonne national laboratory collaborators is among *Physics World*'s top 10 science breakthroughs of 2020. Made of compounds based on the mineral perovskite, the detectors could revolutionize medical and dental imaging by dramatically reducing radiation exposure and the associated health risks. In other fields, the technology could boost resolution in security scanners and research applications. Here, Nie (Center for Integrated Nanotechnologies, MPA-CINT) removes the perovskite devices from a glovebox where the detectors were fabricated. *Physics World* editors selected the team's work as one of the 10 most notable achievements among more than 550 new research papers they covered in 2020. The Los Alamos portion of the work was supported by the Laboratory Directed Research and Development Program.

Associate Laboratory Director for Physical Sciences: Antoinette J. Taylor

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For more information about this publication, contact aldps-comm@lanl.gov.

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Los Alamos NATIONAL LABORATORY

NNSA National Nuclear Security Administration